

GORDON TECH HIGH SCHOOL CURRICULUM GUIDE

Course Title: Calculus (Advanced Placement)
Department of: Mathematics

COURSE DESCRIPTION: The student will study the fundamentals of both differential and integral calculus, as well as their application to physical problems in the real world. Students who master the content of this course will be prepared for the Advanced Placement Examination conducted by the College Examination Board.

COURSE GOALS / OBJECTIVES: The student will:

- determine maximum and minimum points of a graph and interpret the results in problem situations
- use limiting processes to examine infinite sequences and series and areas under curves
- apply the conceptual foundations and applications of limit, the area under a curve, the rate of change, and the slope of a tangent line to other problem situations in other disciplines
- analyze the graphs of polynomial, rational, radical, and transcendental functions
- use instructional technology to provide meaningful visual representations of calculus concepts
- communicate calculus notions verbally and in writing
- read and interpret written presentations of calculus ideas with understanding

COURSE OUTLINE:

Unit 1: **Relations and Functions**

Unit 2: **Limits of Functions**

Unit 3: **Derivatives**

Unit 4: **Applications of Derivatives**

Unit 5: **Integration**

Unit 6: **Applications of the Definite Integral**

Unit 7: **Logarithmic and Exponential Functions**

Unit 8: **Inverse Trigonometric Functions**

Unit 9: **Differential Equations**

ACTIVITIES:

Small groups of students will work as a team to share ideas, solve problems, and justify conclusions.

Students will use a variety of forms of technology, including:

interactive computer software, which involves students in manipulating objects and graphs on the screen to explore concepts and relationships;

MATERIALS:

Textbook, workbook, pencil, graphing calculator

EVALUATION:

Homework assignments

Test and quizzes

Portfolios, which may contain results of works such as these:

open-ended questions, problems, and tasks: The student discusses in writing a mathematical situation, formulates hypotheses, makes generalizations, and so on;

research projects: The student uses resources outside the classroom in order to complete a long-term project;

journal entries: The student keeps written entries detailing such things as the methods used in solving a particularly difficult or interesting problem, or reflections and reactions about specific assignments or class activities;

cooperative learning activities: The student writes a summary of the work accomplished;

demonstrations: Students working individually, in pairs, or in groups demonstrate ideas using manipulatives, graph paper, compasses, calculators, or computers;

investigations: The student keeps a log which includes the date, a description of the work done, and questions the student has for the teacher. The teacher's response to the questions is recorded in the log;

models and simulations: The student writes a summary which describes the activity and includes relevant diagrams, sketches, and photographs;

non-routine problems: The student restates the problem in his own words, explores the problem by drawing a picture or a chart, chooses a strategy such as guess and test, look for a pattern, logical deduction, working backward, or exhaustive listing, and carries out the chosen strategy to solve the problem;

interviews: The student talks while the teacher listens and asks questions regarding the learner's thought processes as related to specific problems;

time-staggered samples: The student collects work samples dealing with the same mathematical idea completed at different times during the year.

Error notebooks: students keep a list of specific homework, test, and quiz problems that resulted in errors. A three-column format might include a statement of the problem as posed, a statement of the exact error made, and a correction and comment.

Specific Examples of Assessment Items:

Given the equation of a function, find its derivative by using the formal definition and by using appropriate formulas. Sketch the graphs of both the given function and its derivative. Choose a variety of points on the original graph at which to draw corresponding tangent lines. Explain how the slopes of these tangent lines are used to determine the nature of the graph of the derivative.

Choose an appropriate method of integration to find the volume of the solid that results when the area of the region enclosed by given equations is revolved about a given axis. Illustrate the situation by means of a diagram, and explain why you selected your method of integration.

Given the graph of a function, perhaps defined in a piecewise fashion, calculate requested limits.